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General WPL Fite

FRANK KEATING
Governor

State of Oklahoma
DEPARTMENT OF ENVIRONMENTAL QUALITY

September 19, 1997

Mr. Ed Fite
Oklahoma Scenic Rivers Commission
P.O. Box 292
Tahlequah, Oklahoma 74465

Re: Illinois River Project - Potential Impact of Wastewater

Dear Mr. Fite:

Please find enclosed a copy of the final report concerning the potential for individual wastewater systems to impact the quality of the Illinois River. This cooperative effort between the Oklahoma Scenic Rivers Commission (OSRC) and the Oklahoma Department of Environmental Quality (DEQ) has been quite successful.

DEQ would like to thank you and your staff for providing the assistance needed to ensure that this was not only a comprehensive effort but one which has been completed in a timely manner. The dedication of OSRC staff to the protection and preservation of the environment and natural resources of the state is much appreciated. As this goal is one shared by DEQ as well, DEQ looks forward to continuing this cooperative approach with OSRC in the future. Once again, thank you and your staff for the effort put forth during this project.

If you have any questions or comments, please feel free to contact me at (405) 271-5205.

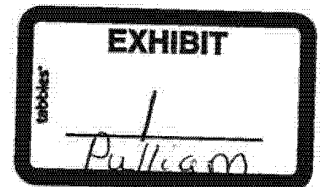
Sincerely,

Jon L. Craig

Jon L. Craig, Director
Water Quality Division

Enclosure

cc: Representative Larry Adair
Senator Rick Littlefield
Senator Herb Rozell



1000 Northeast Tenth Street, Oklahoma City, Oklahoma 73117-1212

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ODEQ-117-0000288

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ODEQ-117-0000289

ILLINOIS RIVER PROJECT
POTENTIAL IMPACT OF WASTEWATER

AUGUST 1997

WATER QUALITY DIVISION
DEPARTMENT OF ENVIRONMENTAL QUALITY



ODEQ-117-0000290

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EXECUTIVE SUMMARY

The Oklahoma Department of Environmental Quality (DEQ), in cooperation with the Oklahoma Scenic Rivers Commission (OSRC), conducted this study to evaluate the potential impact wastewater management systems may have on the quality of the Illinois River. The primary objective of this study was to identify non-residential septic systems. Residential septic systems were only evaluated when there were multiple dwellings utilizing the same system, a significant number of dwellings were concentrated in a given area, or if the system was utilized as part of some commercial activity. The initial focus was on septic systems; however, to ensure a comprehensive evaluation of wastewater systems in the area, disposal systems such as pit privies, lagoons, and wastewater treatment plants were identified as well.

Data collection for this study was performed over a two week period between July 9 and July 17, 1997. Staff from DEQ and OSRC worked cooperatively to collect data to ensure a comprehensive evaluation of systems within the defined study area. Study objectives were to locate sites of interest and then collect sufficient site specific data to allow staff to make a determination on a system's potential to impact the quality of the Illinois River. This study identified fifty-nine septic systems, three community wastewater treatment plants, and eight pit privies. Site information was brought into a Geographic Information System allowing staff to determine that the majority of sites were located significant distances from the Illinois River and its tributaries. Data collected during onsite interviews were utilized to estimate wastewater flow volume and effluent concentrations being managed by systems. Wastewater flow estimation was based on average number of users and type of activity identified at each site. Once flow volumes were determined, estimates of effluent concentrations were derived by applying a formula based on average constituent concentrations per volume of wastewater. Flow estimates indicated that most septic systems handled fairly small flow volumes. Since effluent concentrations are proportional to volume of wastewater flow, relatively small flow volumes result in low concentrations of effluent. The effluent concentration estimations for

septic systems are indicative of concentrations being discharged through the soil absorption system into the sub-surface. All but one of the pit privies were non-discharging systems, the one exception was outside defined buffers and seldom used. The three wastewater plants, operating under specific guidelines, treat wastewater sufficiently to prevent harmful concentrations of effluent from being released to the environment. Based on these findings, systems identified in this study were found to pose no apparent significant threat to the quality of the Illinois River.

STUDY AREA

This study took into consideration the portion of the Illinois River lying between Lake St. Francis and State Highway 82, at which point Tenkiller Lake is considered to begin. To ensure sufficient coverage, an area consisting of a one-half mile buffer on either side of the Illinois River and a one-quarter mile buffer on either side of selected tributaries was defined as the primary area of interest (refer to Fig. 1). Although facilities which fell within these delineated buffers were the primary focus of this study, nearby sites were evaluated as well to ensure a comprehensive evaluation of the area.

METHODOLOGY

Once sites were located, system owner/operators were interviewed to collect data necessary to allow staff to accurately evaluate each system. During these interviews staff attempted to determine the type of system, type of use, number of users, and information concerning system integrity. These data were then used to make estimates of effluent volumes managed by each system and evaluate a system's potential to negatively impact the environment.

While on site, locational data (latitude and longitude) were collected for each system utilizing Differential Global Positioning System (DGPS) technology. This process involves the collection of satellite information being transmitted from the NAVSTAR constellation of military satellites. The field data are then processed resulting in a geo-referencing coordinate with an accuracy of 2-5 meters. These data, along with pertinent information concerning facility type, usage, and estimates of effluent volumes were then imported into a Geographic Information System (GIS) for mapping and evaluation (see Figures 1-16). Once displayed through GIS, staff determined distances between each system and the Illinois River or nearest tributary. This information was then broken down by system type and whether the site fell within or outside the defined buffers (refer to Tables 4-7). Several maps were produced at

different scales to allow better viewing of information. The entire study area with system locations and defined buffers is shown in Figure 1. Smaller scale maps were then produced to allow better viewing of detailed information (see Fig. 3-15). An index map showing the location of these maps is found in Figure 2.

Estimates of wastewater flow were determined utilizing the number of users estimated from survey data and average wastewater flows for defined user types (Metcalf & Eddy, Inc., 1979).

Flow per unit values used to estimate total daily flow ranged from 5 gpd for recreational type facilities to 42.5 gpd for full time residences. User types were often found to include a combination of several categories. In these cases flow volumes were somewhat subject to interpretation; however, when in doubt a conservative estimate was utilized.

Once flow volumes were established, estimates were made characterizing the septage. Effluent concentrations were estimated for BOD, suspended solids, ammonia-N, and total phosphorus. Estimates for these constituent concentrations were derived from median values for a typical wastewater effluent (Canter and Knox, 1985) as follows:

- a) BOD - 28-84 mg/l
- b) Suspended Solids - 18-53 mg/l
- c) Ammonia-N - 10-78 mg/l
- d) Total Phosphorus - 6-9 mg/l

The results of these estimations were then broken down by system type (refer to Tables 1-3). The pit privy systems are total containment systems which are cleaned as needed. Since these systems do not release to the environment, constituent concentrations were not calculated.

RESULTS AND DISCUSSION

When operating properly, systems such as septic systems, lagoons, and wastewater treatment plants do not release wastewater effluent into the environment at concentrations which would have a negative impact. By design, biological/chemical processes and evapotranspiration of fluids reduce wastewater constituents to concentrations that will have no detrimental impact. Design, maintenance, and operational standards exist to ensure that wastewater systems are installed and operate properly. Therefore, if systems are installed properly and operated according to design there should be no negative impact to the environment.

During the initial site visit, systems were inspected to determine if they were functioning properly. Of the sites inspected, only one appeared to have any problems. The septic system at Flint Ridge RV Park II had fluid seeping from what appeared to be the clean out port of a septic tank. This problem was noted and will be addressed through standard procedures by local personnel.

Most systems were physically located a significant distance from the Illinois River and tributaries. The average distance of separation for septic systems was 726 feet for systems within defined buffers and 1508 feet for systems outside defined buffers (ref. to Tables 4&5). The distance of separation for septic systems is significant in that larger distances result in a longer time-of-travel for effluent to reach a stream as seepage. The larger the distance of separation, the longer it would take wastewater to move towards and potentially seep into streams. In the event that wastewater effluent of a high concentration was released into the subsurface environment, a significant distance of separation would allow natural processes (degradation and filtering) to remove contaminants prior to discharge.

The average distance of separation for pit privies within the defined buffer was 223 feet (ref. to Tables 7); however, these systems do not release effluent as long as system integrity is not compromised. Since identified pit privies appeared to be functioning properly, proximity to the stream is not a concern. Of the three community wastewater treatment plants (ref. to Table 6) identified in this study, two discharge treated effluent directly to the Illinois River and one land applies through irrigation. The discharging systems are designed and operated in a manner to ensure that any waters discharged into the stream will be at acceptable levels. The land application system does not have a discharge. All applied water is absorbed by the soil and the grasses at the application site. These plants operate under specific guidelines and are monitored to ensure that there is no negative impact to the environment.

As mentioned previously, data collected during onsite interviews were utilized to estimate wastewater flow volume and effluent concentrations being managed by systems (ref. to Tables 1&2). These estimations were made utilizing typical values for wastewater flows for specific uses and effluent concentrations per unit flow volume. This information provides some indication of the typical loading rates, for specified constituents, that could be expected at these sites. In addition, this information reflects differences resulting from different facility use types (i.e. recreational park facility or composite systems for housing editions). These data are most useful in showing that effluent concentrations differ dramatically based on the number of users and user types.

CONCLUSIONS AND RECOMMENDATIONS

The results of this study indicated the following:

1. The number of small non-residential wastewater systems identified within the study area were relatively few.
2. The majority of small non-residential wastewater systems located handled low volumes of wastewater.
3. Onsite inspections identified only one small non-residential wastewater system which appeared to have functional problems.
4. In most cases there was a significant distance of separation between small non-residential wastewater systems and the Illinois River and tributaries.

Based on these findings, systems identified in this study were found to pose no apparent significant threat to the quality of the Illinois River. To prevent any future problems from impacting the Illinois, current construction, operational, and maintenance standards should continue to be followed and monitored.

REFERENCES

Metcalf & Eddy, Inc., 1979: Waste Water Engineering: Treatment/Disposal/Reuse.

Canter, Larry W. and Knox, Robert C., 1985: Septic Tank System Effects on Groundwater Quality.

Oklahoma State Dept. of Environmental Quality, Title 252 Oklahoma Administrative Code, Chapter 640, February, 1997: Individual and Small Public Sewage Disposal.

APPENDIX I

SITE MAPS

ODEQ-117-0000300

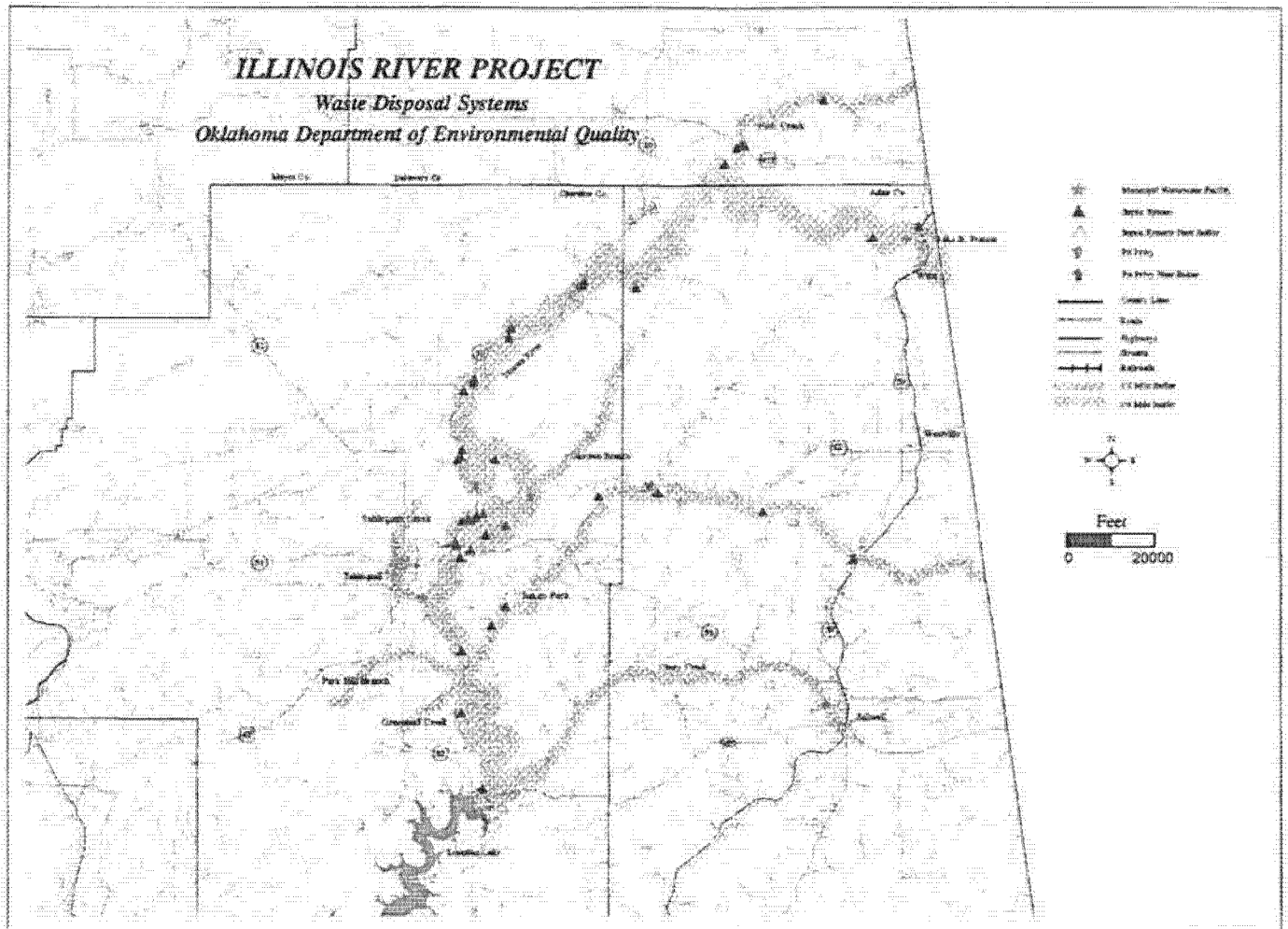


Figure 1. Map of Study Area Showing Defined Buffers and Location of Wastewater Systems

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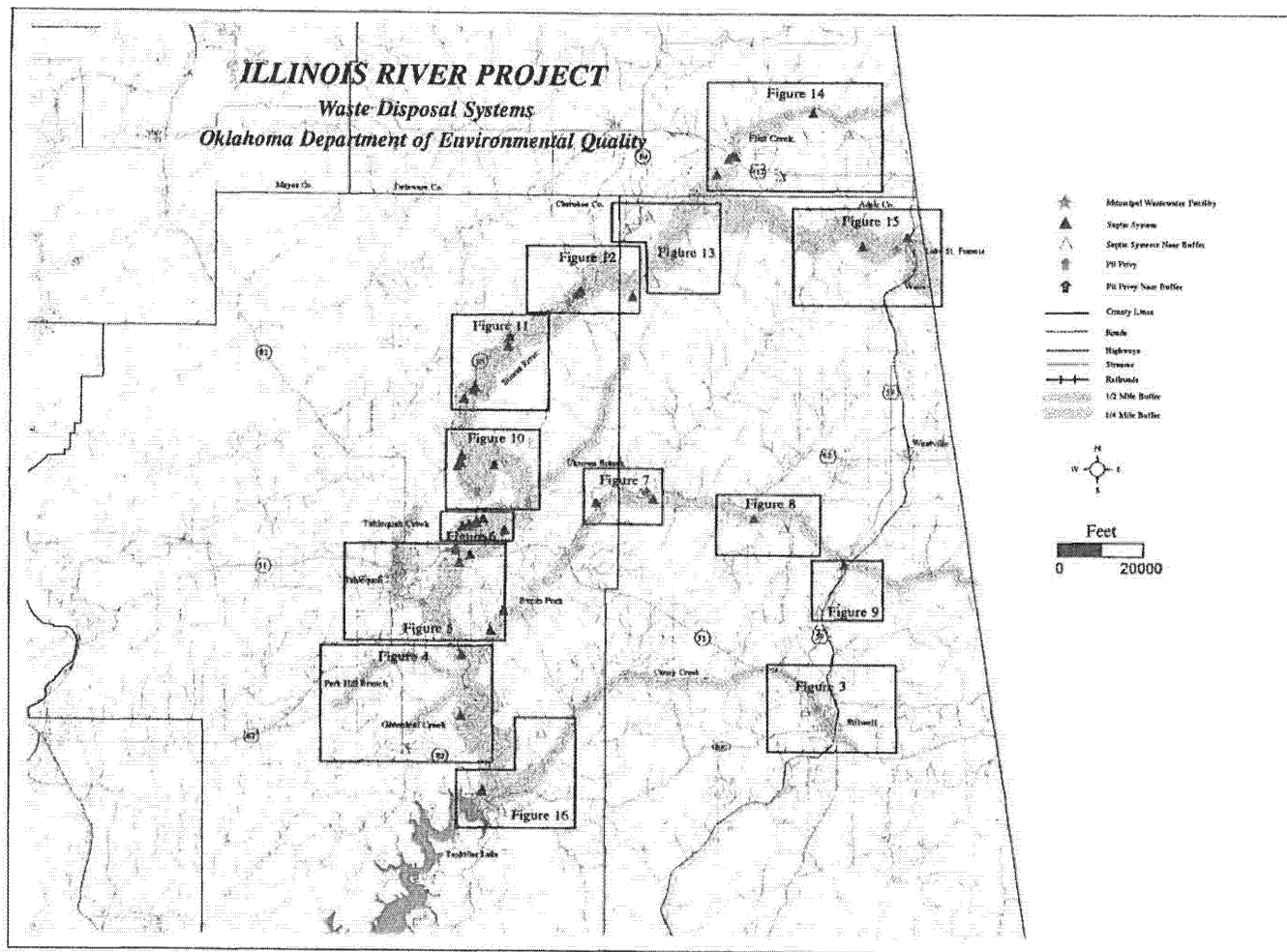


Figure 2. Index for Smaller Scale Maps

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